US009085347B2

(12) **United States Patent**
Antonelli

(10) **Patent No.: US 9,085,347 B2**
(45) **Date of Patent: Jul. 21, 2015**

(54) **HULL STRUCTURE ESPECIALLY FOR RECREATIONAL VESSELS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 85 days.

(21) Appl. No.: **13/809,342**

(22) PCT Filed: **Jul. 18, 2011**

(86) PCT No.: **PCT/EP2011/062222**

§ 371 (c)(1),
(2), (4) Date: **Jan. 16, 2013**

(87) PCT Pub. No.: **WO2012/010545**

PCT Pub. Date: **Jan. 26, 2012**

(65) **Prior Publication Data**

US 2013/0112130 A1 May 9, 2013

(30) **Foreign Application Priority Data**

Jul. 19, 2010 (IT) PS2010A0020

(51) **Int. Cl.**
B63B 43/14 (2006.01)
B63B 7/02 (2006.01)
B63B 35/73 (2006.01)

(52) **U.S. Cl.**
CPC . ***B63B 43/14*** (2013.01); ***B63B 7/02*** (2013.01); ***B63B 35/73*** (2013.01)

(58) **Field of Classification Search**
CPC B63B 1/14; B63B 2001/145; B63B 7/02; B63B 43/14
USPC 114/61.15, 61.18, 123, 284, 85
See application file for complete search history.

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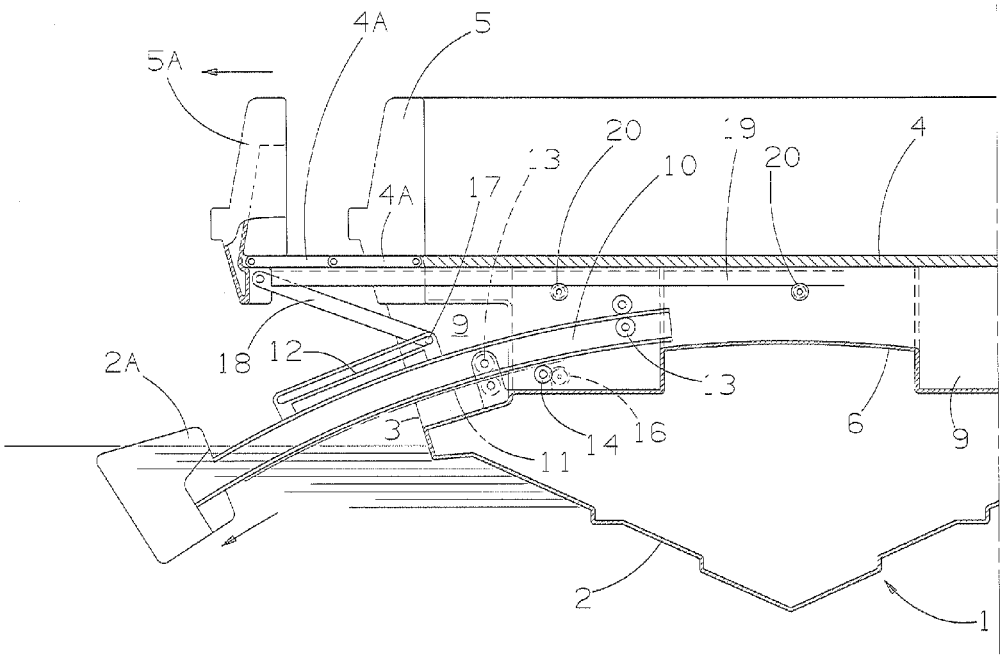
(57) **ABSTRACT**

A hull structure, especially for recreational vessels, includes at least one insulated bottom element section or moveable bottom element displaceable laterally by means of projecting actuators from a position adhering to the hull and preferably recessed into a respective shape, to at least one position projecting outside of the hull, with respect to which members for widening the deck project therewith in synchronism with the at least one displaced hull section or displaced moveable bottom element and vice versa.

3 Claims, 10 Drawing Sheets



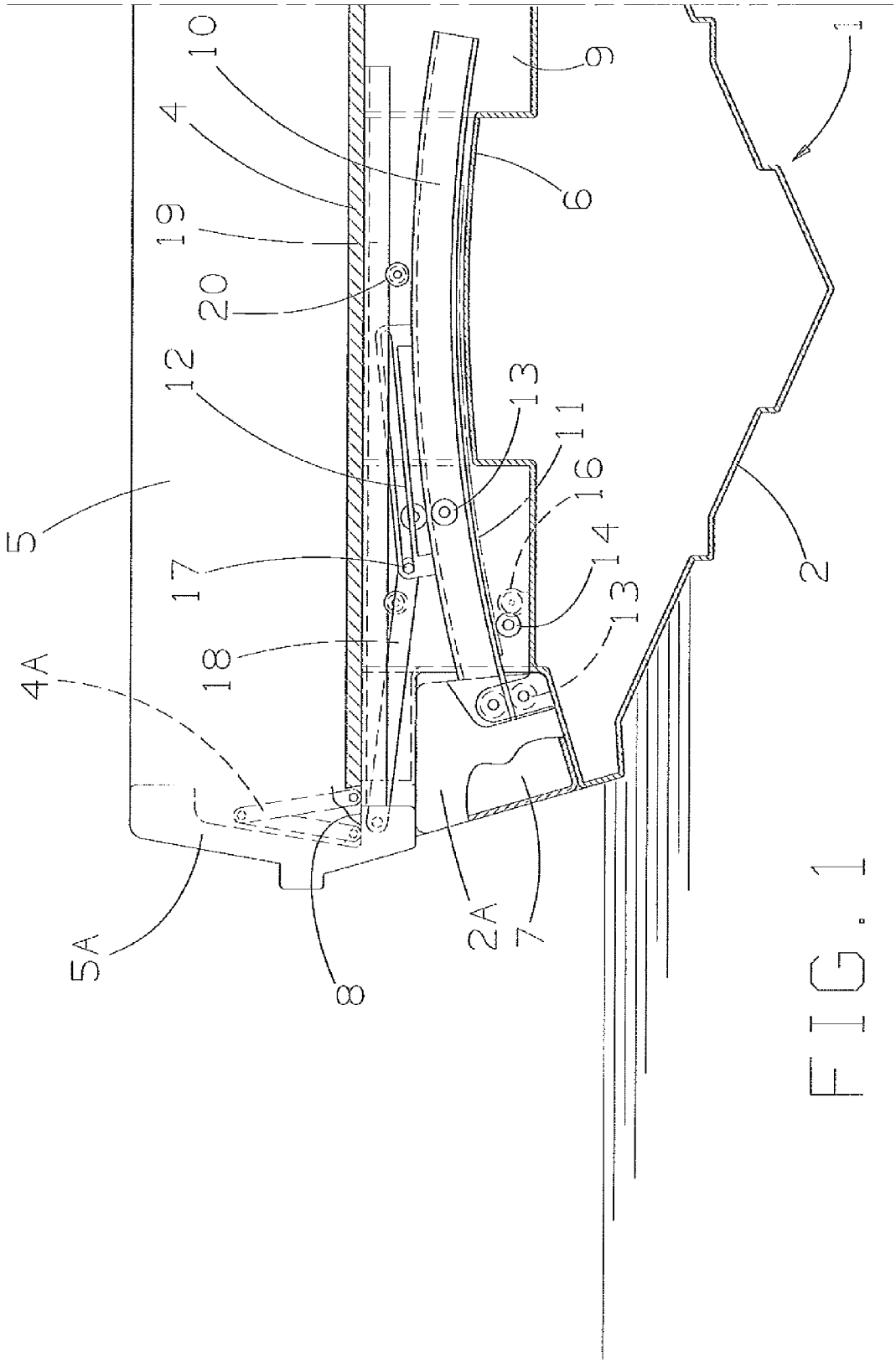


FIG. 1

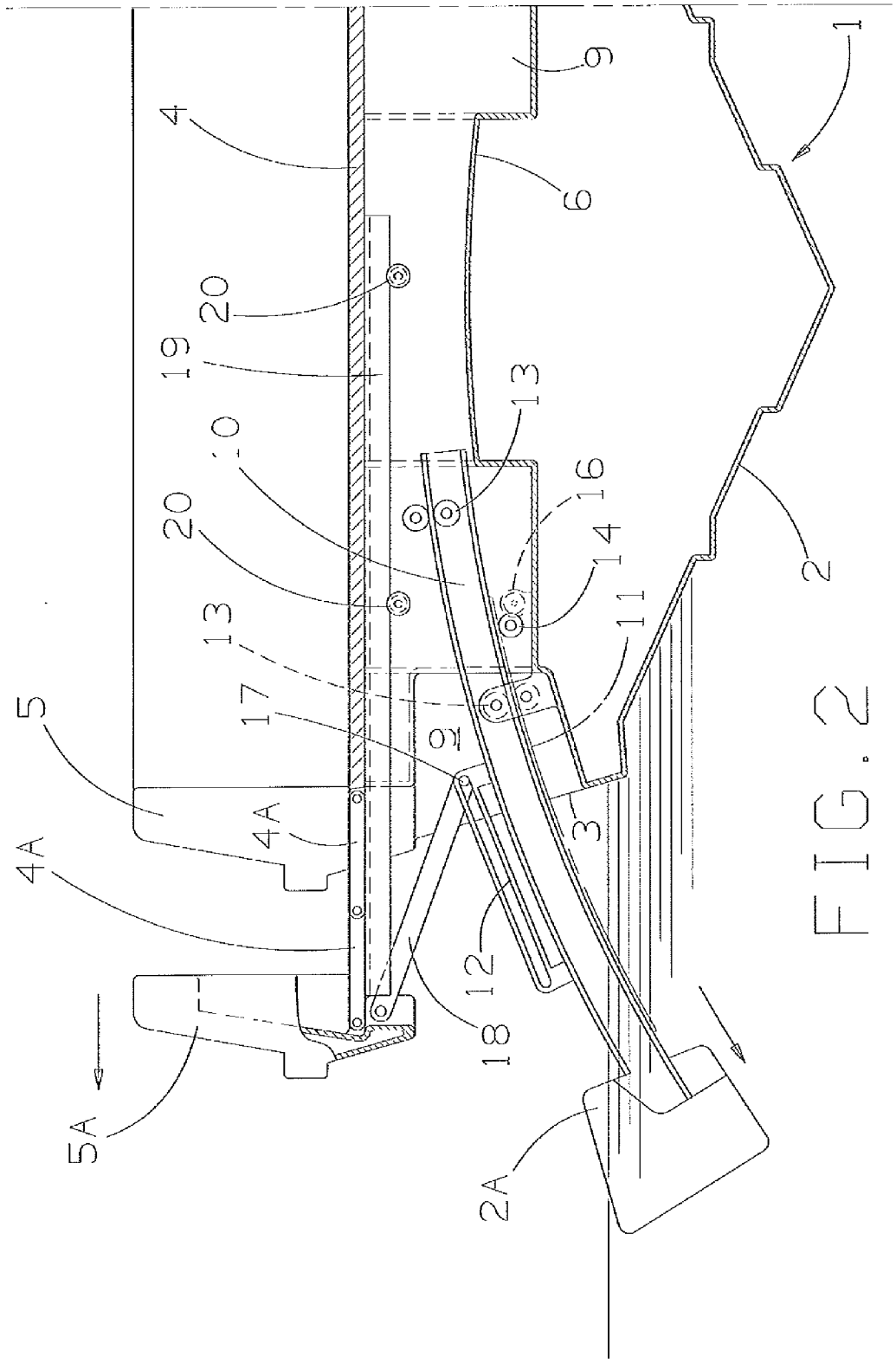


FIG. 2

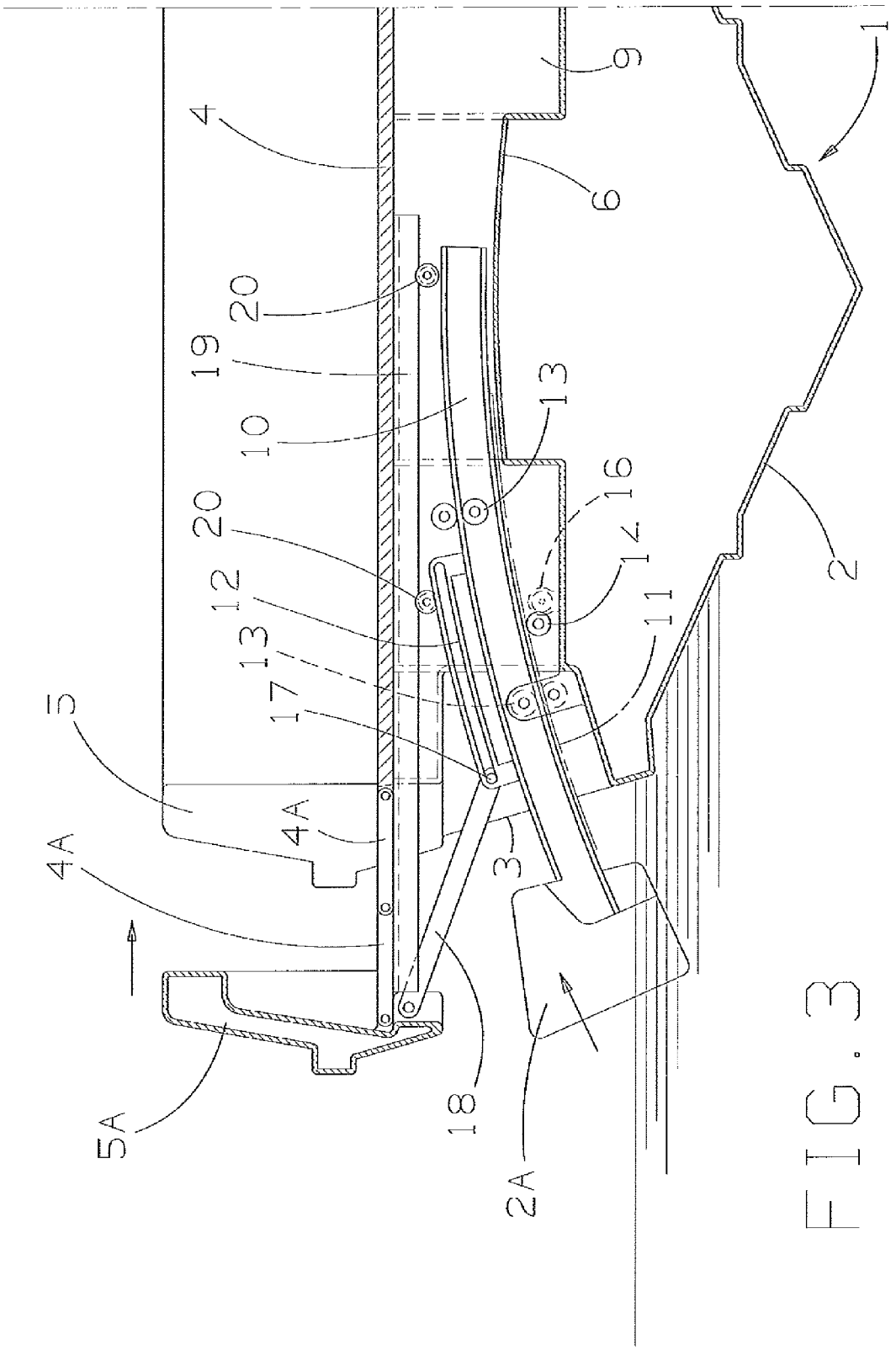


FIG. 3

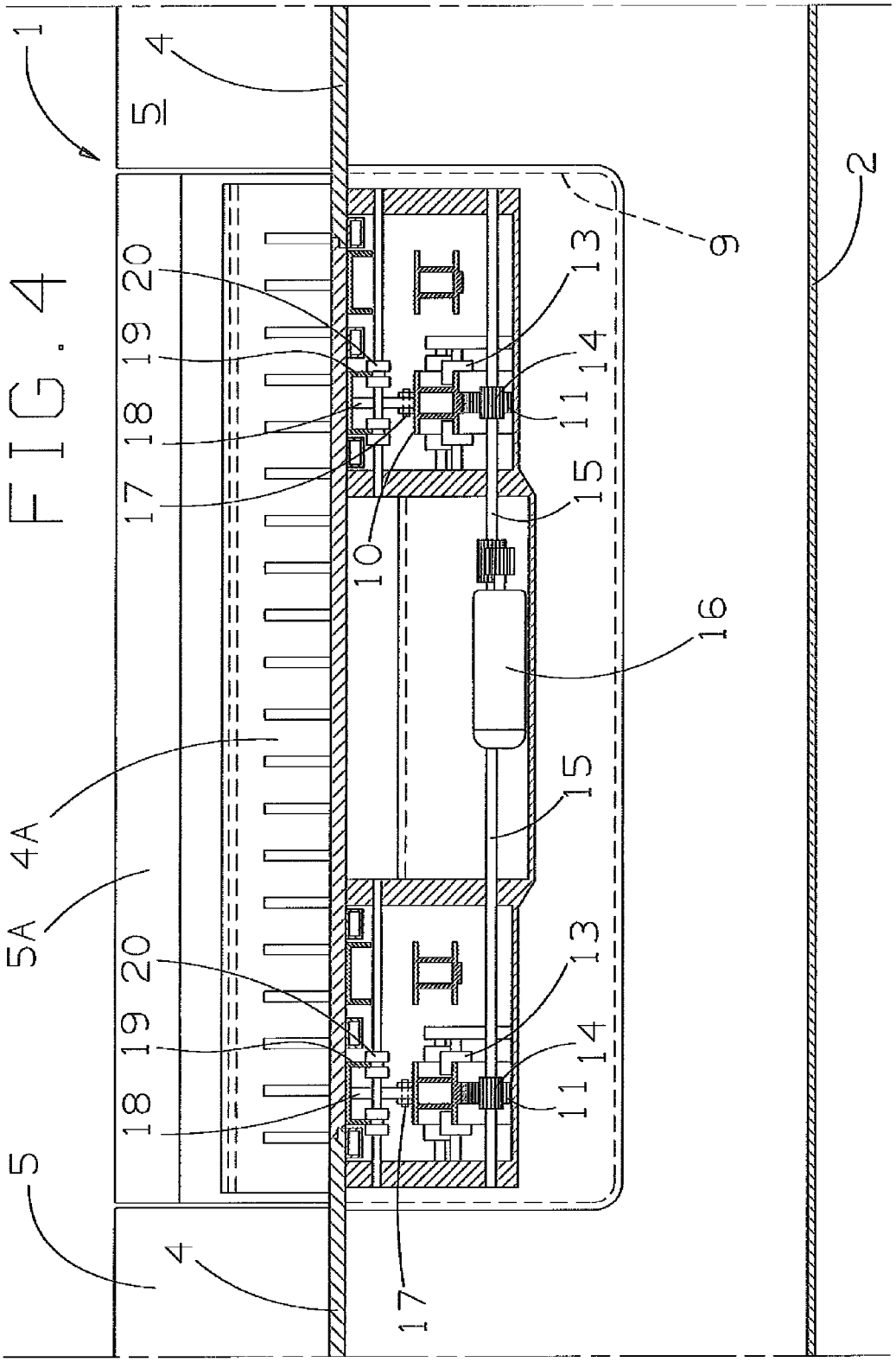


FIG. 4

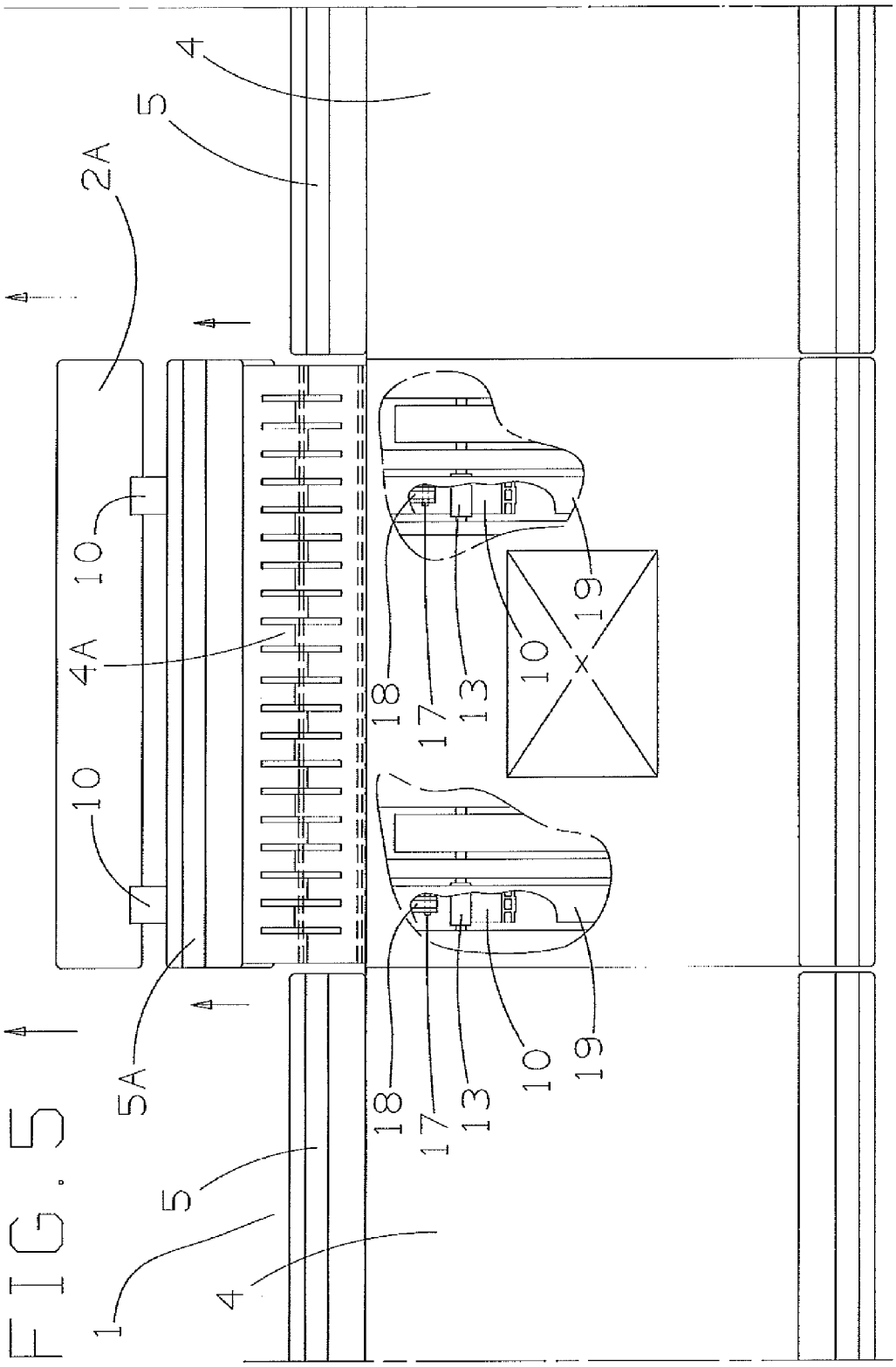


FIG. 5

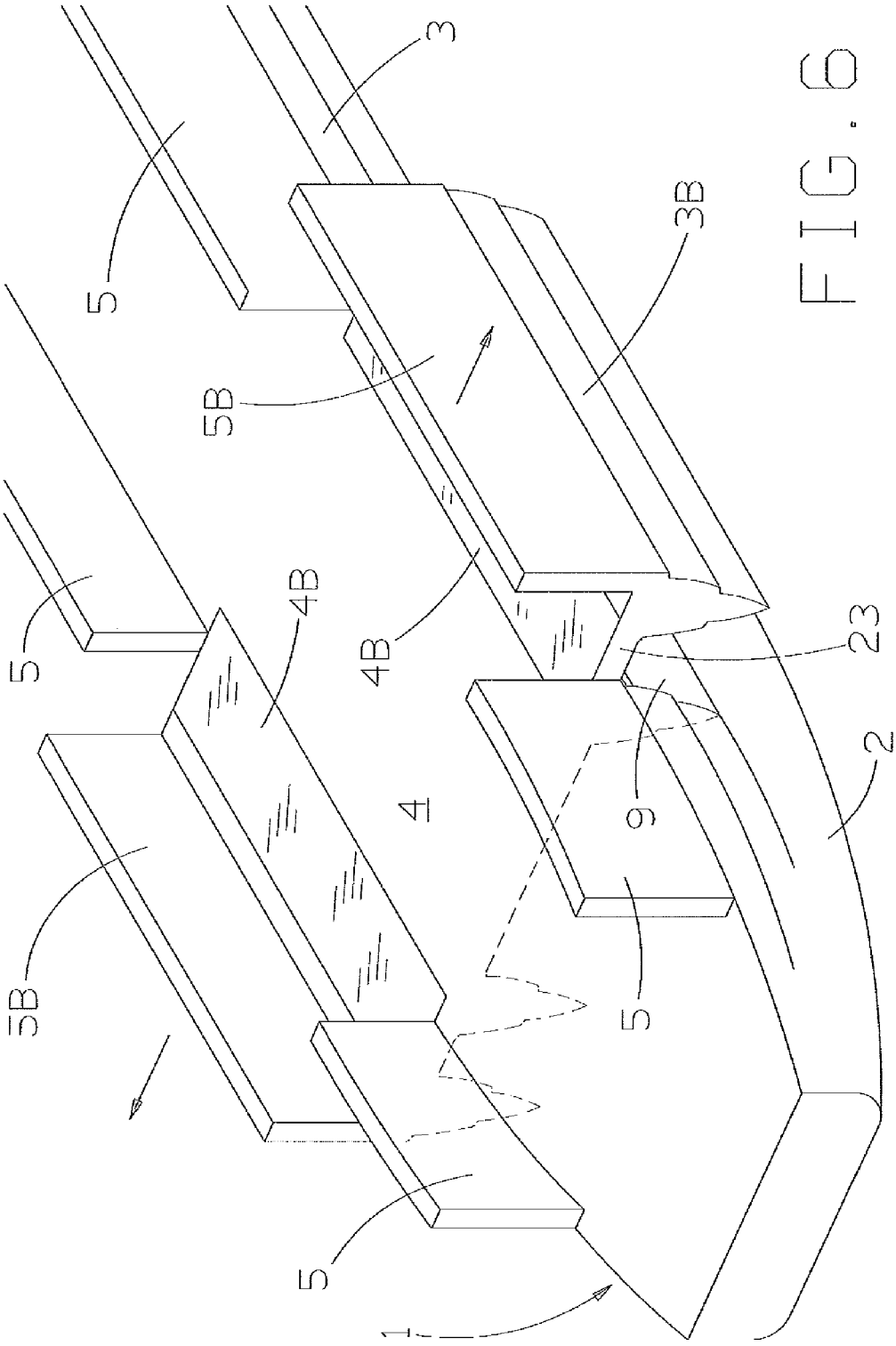


FIG. 6

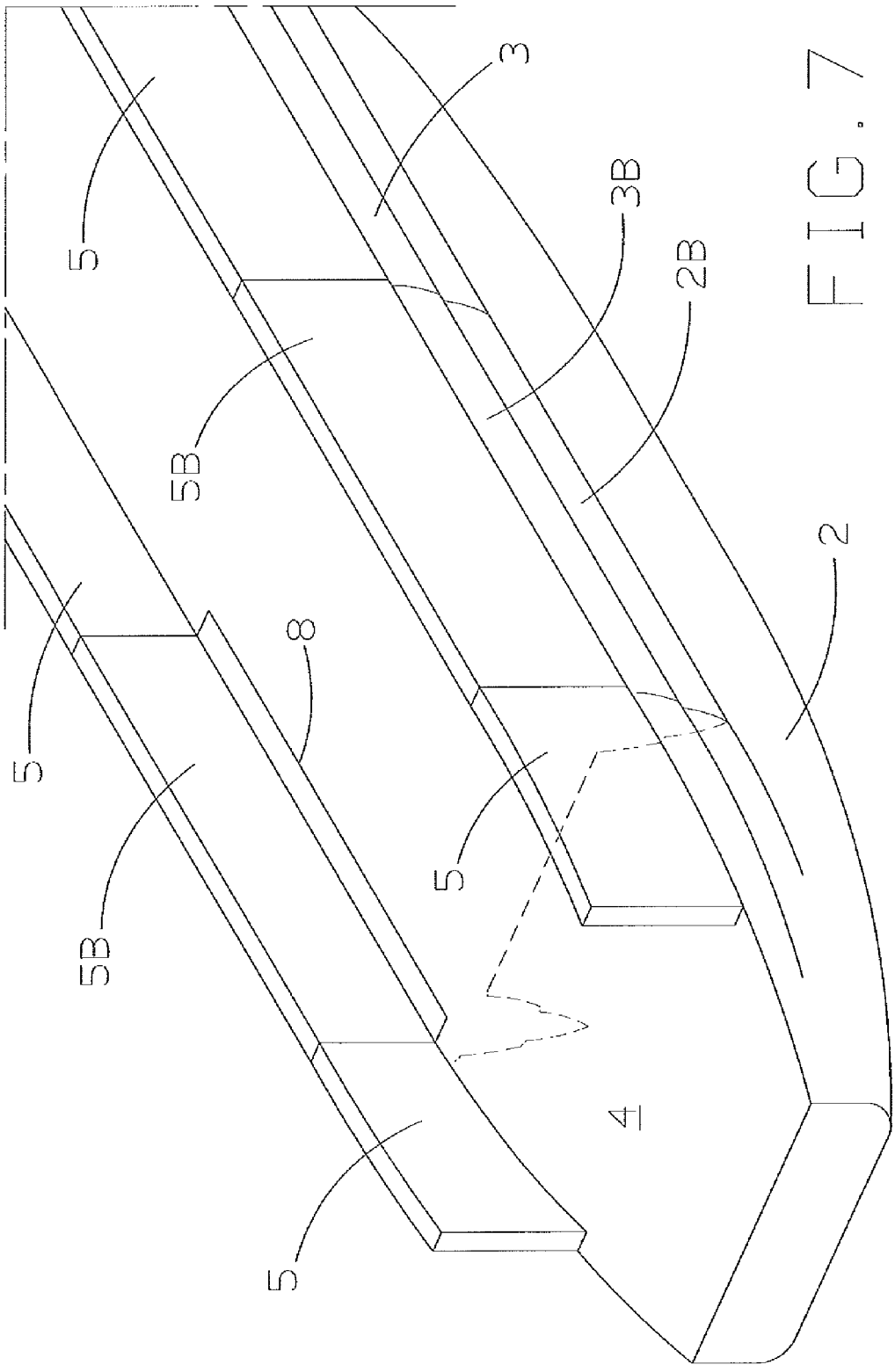


FIG. 7

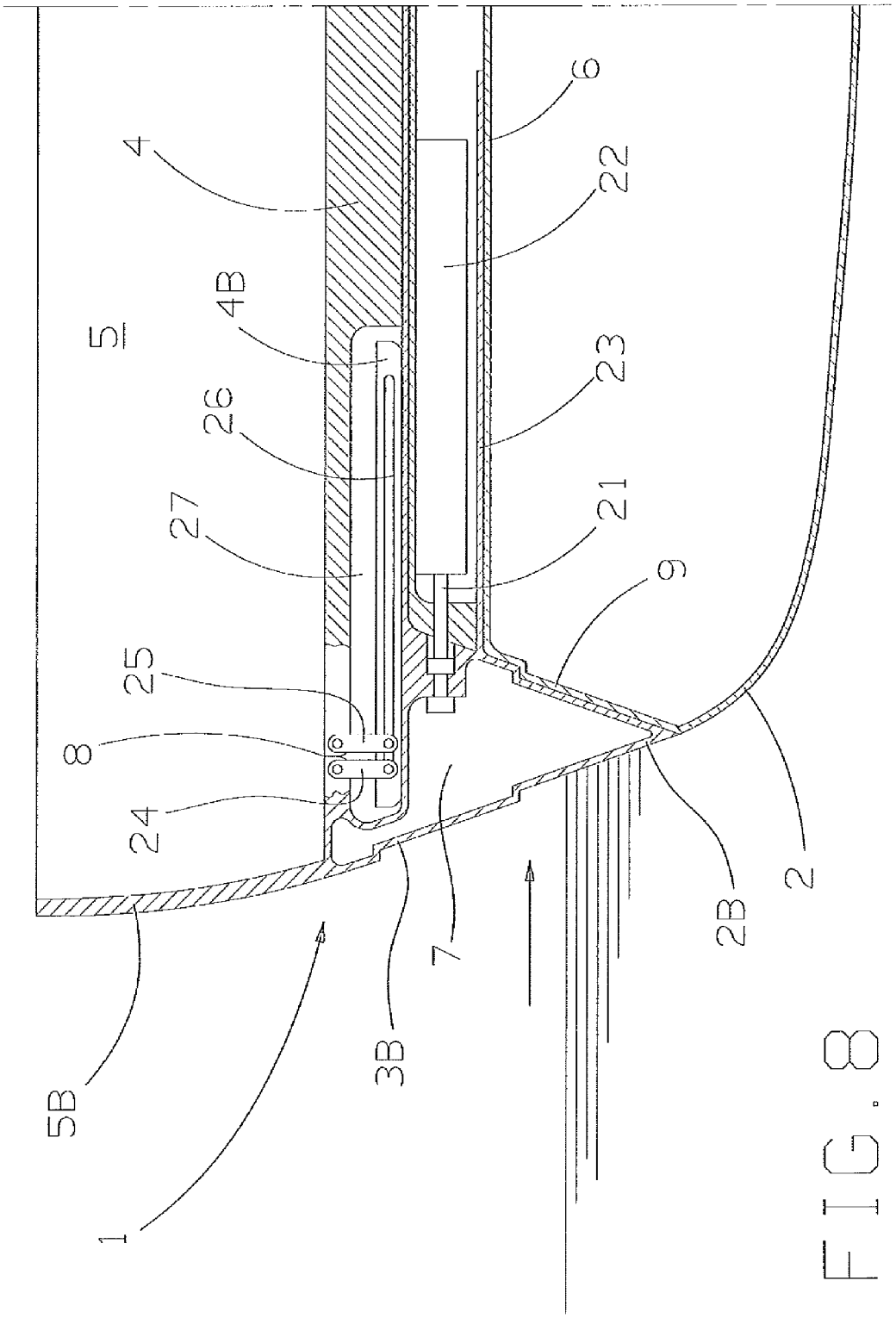


FIG. 8

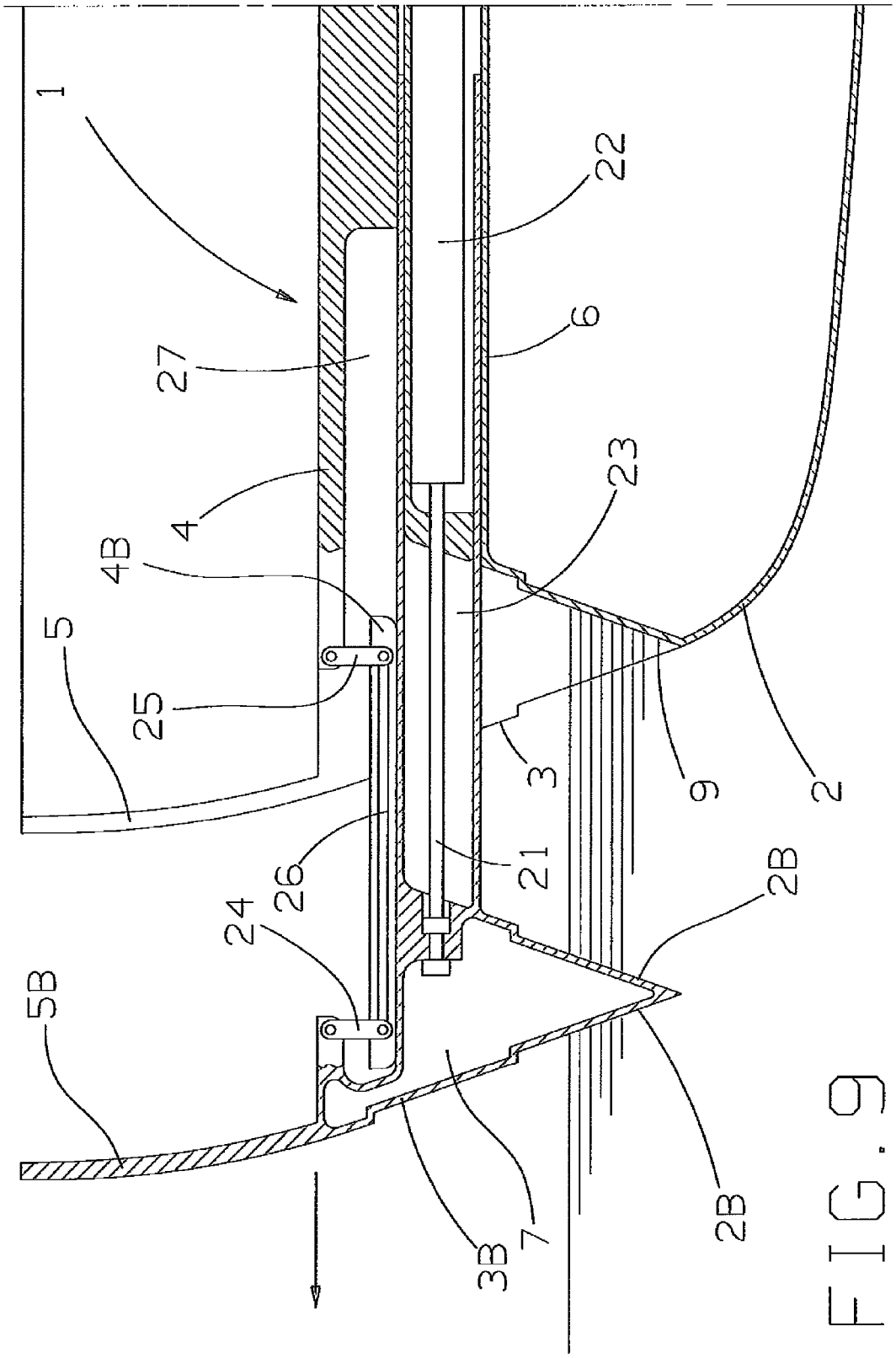


FIG. 9

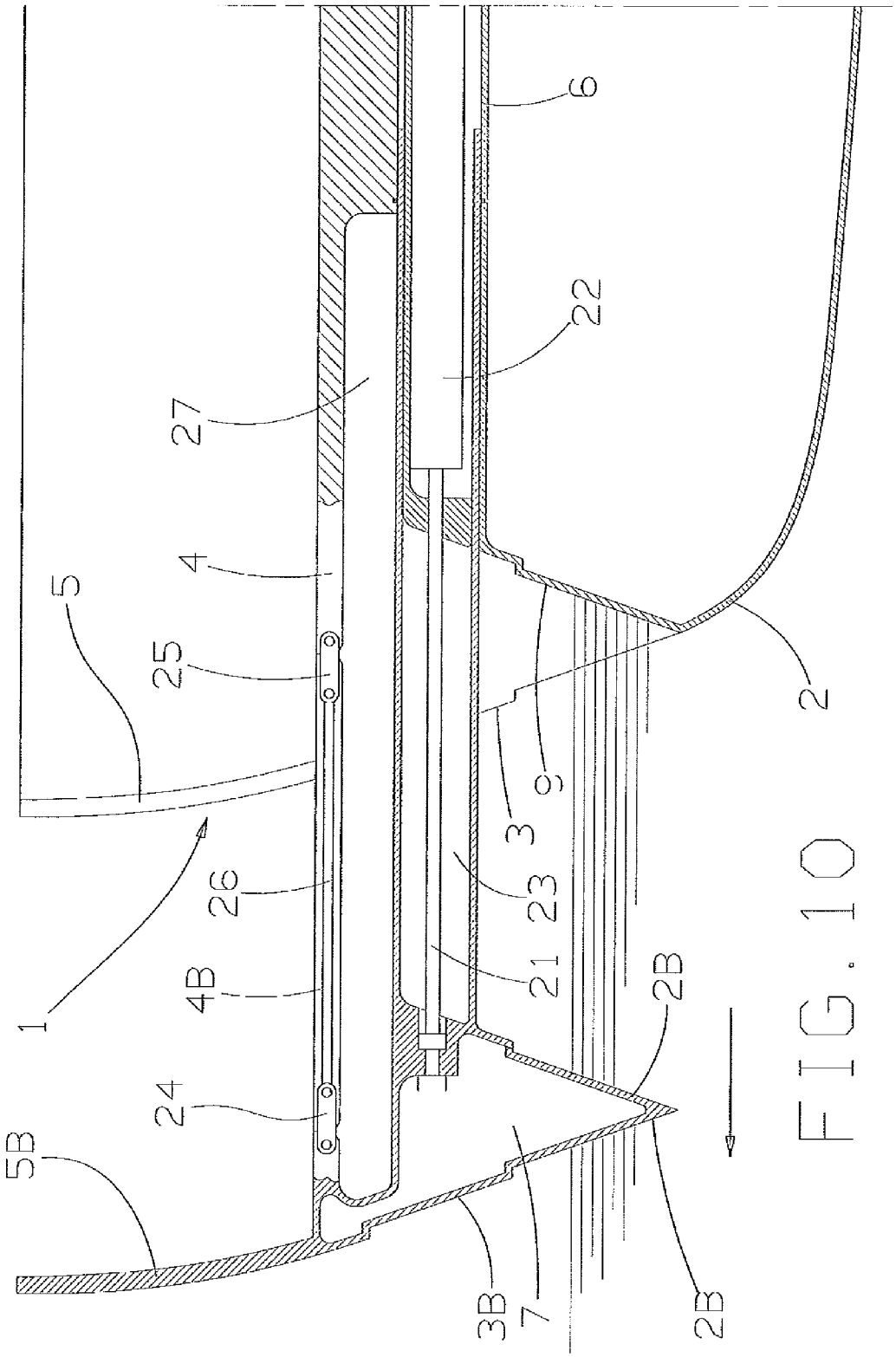


FIG. 10

HULL STRUCTURE ESPECIALLY FOR RECREATIONAL VESSELS

DETAILED DESCRIPTION

1. State of the Art

In recreational sailing habitability aspects of the recreational vessels—in particular when the vessel is anchored on the docks and near the coast to allow the occupants to bathe in the sea, sunbathe and convivial contexts, a use condition which, in such kind of vessels, is usually more frequent with respect to sailing which usually ends after a few miles of sailing—play a fundamental role.

2. Objects of the Invention

In this context, the main object of the present invention is to provide a solution concept capable of allowing exploiting a greater manoeuvrability of the vessel especially recreational vessels, while anchored, offshore.

Another object of the present invention is to attain the previous object through a concept solution that does not negatively impact the seaworthiness qualities of the vessel and which however does not jeopardise sailing.

Still another object is that of attaining the previously mentioned objects through a concept solution capable of maintaining low overall dimensions of the vessel at the port anchoring mooring site.

A further object of the present invention is to avoid a negative impact on the safety of the vessel.

Still another object of the present invention is to attain the previously mentioned objects through a concept solution that is simple and efficient, safe during operation and relatively inexpensive considering the results practically attained therewith.

SUMMARY OF THE CONCEPT SOLUTION

These and other objects are attained by means of the hull structure, especially for recreational vessels, according to the present invention, comprising at least one isolated bottom element section (**2**A, **2**B) or moveable bottom element (**2**A, **2**B) displaceable laterally by means of projecting actuators (**10**, **11**, **14**, **16**, **21**, **22**) from a trim adhering to the hull (**1**) and preferably recessed into the respective shape, to at least one trim projecting outside the hull (**1**) with respect to which means (**4**A, **4**B) for widening the cover (**4**) project therewith balanced by said at least one displaced hull section (**2**A, **2**B) or displaced moveable bottom element (**2**A, **2**B) and vice versa.

DESCRIPTION OF THE ATTACHED DRAWINGS

Further characteristics and advantages of the hull structure according to the present invention shall be more apparent from the following detailed description of the preferred but non-exclusive embodiments thereof, represented solely by way of non-limiting example in ten attached drawings, wherein:

FIGS. **1**, **2** and **3** show cross-sectional schematic views of a recreational vessel, provided with the hull structure according to the present invention, in a first exemplifying embodiment thereof, represented in an equivalent number of operative configurations;

FIG. **4** shows a longitudinal section schematic view of a portion of a recreational vessel, provided with the hull structure according to the present invention, in a first exemplifying embodiment thereof;

FIG. **5** shows a flat section schematic view of a portion of a recreational vessel provided with the hull structure according to the present invention, in a first exemplifying embodiment thereof;

FIGS. **6** and **7** show perspective views of a portion of a recreational vessel, provided with the hull structure according to the present invention, in a second exemplifying embodiment thereof, represented in an equivalent number of operative configurations;

FIGS. **8**, **9** and **10** show cross-sectional schematic views of a recreational vessel, provided with the hull structure according to the present invention, in a second exemplifying embodiment thereof, represented in an equivalent number of operative configurations.

STATIC DESCRIPTION OF A FIRST EMBODIMENT

With reference to such figures, in the figures numbered from **1** to **5**, there is illustrated a first alternative embodiment of the hull structure according to the present invention, where **1** is used to indicate the hull, **2** is used to indicate the bottom element closed by a shaped airtight bridge **6**, **3** is used to indicate the top side, **4** is used to indicate the cover and **5** is used to indicate the plankings or gunwales.

On the two sides of the hull **1** there are respectively defined longitudinal bottom sections **2**A, hereinafter also referred to as "moveable bottom elements **2**A", or "ejectable bottom elements **2**A", with airtight interior **7**.

Above the moveable bottom elements **2**A there are provided planking sections **5**A, dimensioned with length substantially corresponding to the extension of the underlying moveable bottom elements **2**A, insulated from the cover **4** by means of respective interruptions **8**.

The moveable bottom elements **2**A recede into a shape of the hull **1**, contingently housed, without projecting, in respective complementary compartments **9**, provided on the two sides of the hull **1** (in particular see FIG. **1**).

The moveable bottom elements **2**A are internally constrained to the apices of a respective pair of sectioned curvilinear beams **10**, housed between the bridge **6** and the cover **4**, provided at the lower part with respective racks **11** and above with respective symmetric pairs of slots **12**, which develop parallel to the curvilinear beam of respective reference over a relative longitudinal section.

The curvilinear beams **10**, withheld by guide rollers **13**, can be ejected and retracted by means of pinions **14**, engaged in the racks **11** and connected, by means of shafts **15**, to electric motorisations **16** (also see FIG. **4**).

Within the symmetric pairs of slots **12** of the curvilinear beams **11** there are engaged pins **17** at the foot of connecting rods **18**, which are constrained apically at the other end at the head of the planking or gunwale sections **5**A, in turn integral with sectioned rectilinear beams **19**, sliding beneath the cover **4** on guide rollers **20**.

At the ends of the interruptions **8**, there is constrained a bellow panel **4**A, hereinafter also referred to as "cover extension" and also distinguished with reference **4**A.

All the described structures are symmetrically conceived on the two sides of the hull **1**.

STATIC DESCRIPTION OF A SECOND EMBODIMENT

FIGS. **6** to **8** show a second alternative embodiment of the hull structure according to the present invention, where **1** is used to indicate the hull, **2** is used to indicate the bottom

element closed by an airtight bridge **6**, **3** is used to indicate the top side, **4** is used to indicate the cover and **5** is used to indicate the plankings or gunwales.

On the two sides of the hull **1** there are respectively defined the longitudinal bottom sections **2**B and the top side **3**B with overlying planking sections **5**B, hereinafter generally referred to as "moveable bottom elements **2**B" or "ejectable bottom elements **2**B", which internally delimit airtight chambers **7**, insulated from the hull **1** by means of interruptions **8**, but receding into the respective shape, contingently relatively housed, without projecting therefrom, in complementary compartments **9**, provided on the two sides of the hull **1** (also see FIGS. **8** to **10**).

The moveable bottom elements **2**B are internally constrained to the apices of stems **21** of respective linear actuators **22**, for example constituted by hydraulic pinions, housed between the bridge **6** and the cover **4**.

The travel of the stems **21** occurs in respective telescopic casings **23**, distally integral with the moveable bottom elements **2**B and proximally sliding between the bridge **6** and the cover **4** (see FIGS. **8** to **10**).

At the ends of the upper interruption **8**, in the thickness of the cover **4** there are constrained, on the side of the moveable bottom elements **2**B, the heads of pairs of external connecting rods **24**;

On the contrary, on the side of the hull **1**, at the ends of the upper interruption **8**, in the thickness of the cover **4**, there are constrained the heads of pairs of internal connecting rods **25**.

The pairs of external connecting rods **25** are hinged at the foot to a concealable panel **4**B, hereinafter referred to as "cover extension" and also distinguished with reference **4**B;

The pairs of internal connecting rods **24** are instead at the foot sliding in slots **26**, made laterally on the sides of the cover extension panel **4**B, which is housed in a compartment **27** underlying the cover **4** and comprised between the cover **4** and the telescopic casings **23**.

All the structures are symmetrically conceived on the two sides of the hull.

Dynamic Description of the First Embodiment

Thus having completed the static description of the preferred embodiments of the hull structure according to the present invention, following is the dynamic description thereof, i.e. the relative operation:

- the hull **1**, schematically illustrated in FIG. **1**, can be that of any vessel preferably a recreational vessel, which usually, when anchored on the port and when sailing, is maintained in the small configuration thereof, illustrated in FIGS. **1** and **4**, i.e. with the ejectable lateral portions of the bottom element **2**A, or the moveable bottom elements **2**A, housed in the respective compartments **9** to form a compact hull **1** in its entirety, such as a common hull with a single bottom element.

In particular conditions, especially when the vessel is anchored offshore to allow recreational activities for the occupants, hence meeting the purposes recreational vessels are intended for, by activating electric motorisations **16**, with ensuing actuation of the pinions **14** on the racks **11**, the curvilinear beams **10** with the relative apical portions of the bottom element **2**A, or the moveable bottom elements **2**A, may be ejected outwards, projecting into the water with curvilinear trajectory:

In the first step of such operation (see FIG. **2**) the pins **17**, at the foot of the connecting rods **18**, slide in the respective symmetric pairs of slots **12** integral with the curvilinear beams **10**, up to the end stops provided by the termination of the slots **12**;

- in such kinematic configuration the continuation of the ejection of the curvilinear beams **10** imparts and transfers, by means of the connecting rods **18**, a projection movement outwards the overlying ejectable portions of plankings **5**A and, therewith, to the rectilinear beams **19**, which are dragged outside sliding on the respective guide rollers **20**;
- at the same time, the bellow panel **4**A diverges and extends on the rectilinear beams **19** thus extracted, which thus provide support for local portions **4**A for widening the cover **4**, or cover extensions **4**A, for the contingent requirements greater space for the occupants of the vessel.

At the end of the previously described excursion, the moveable bottom elements **2**A are in the position of maximum projection outside the hull **1**, as illustrated in FIG. **1**, serving as floating balances **2**A of the overlying maximum cantilevered extension of the bridge **4**.

On the contrary, retracting the curvilinear beams **10**, in the first step of such retraction, the pins **17**, at the foot of the connecting rods **18**, slide in the respective symmetric pairs of slots **12** integral with the curvilinear beams **10**, up to the end stop provided by the termination of the slots **12** (see FIG. **3**), thus attaining a more approached position of the moveable bottom elements **2**A to the hull **1**, contingently to the need; for example, in order not to interfere when adjacent to another vessel but still maintaining the cover **4** extended with the cover extensions **4**A completely extended, in the same functional manner aimed at obtaining better habitability.

The operation of retracting the curvilinear beams **10**, with the recession of the moveable bottom elements **2**A into the small shape of the hull and acquisition of the correct sailing trim can be performed or completed before raising the anchor.

All this can be achieved under complete safe operating conditions of the vessel given that all mechanisms and controls are positioned above the airtight bridge **6** of the hull **1**.

Dynamic Description of the Second Embodiment

Regarding the second embodiment, the compact configuration of the hull **1**, during sailing and normal mooring, is illustrated in FIGS. **7** and **8**;

- in this alternative embodiment the relative operation provides for that in the previously mentioned use conditions, when the vessel is anchored offshore to allow recreational activities for the occupants, by actuating the linear actuators **22**, the portions of the bottom element **2**B, or the moveable bottom elements **2**B, may be ejected outwards:
- in such operation the interruptions **8** between the hull **1** and the moveable bottom elements **2**B dilate and, at the upper part, the pairs of internal connecting rods **25** slide into the slots of the side of the panel **4**B, so that, when they reach at the end stop, in combination with the action of the external connecting rods **24**, they stretch it, hence, due to the lever, they raise it to the level of the cover **4** (see FIGS. **9** and **10**), thus attaining local portions **4**B of widening the cover **4**, for the contingent needs of greater space for the occupants of the vessel.

The opposite operation, with the recession of the projections of the bottom element **2**B, the top side **3**B, the cover **4**B and the planking **5**B, or the moveable bottom elements **2**B, into the small shape of the hull **1** and acquisition of the correct sailing trim can be performed before raising the anchor.

All this can be achieved under complete safe operating conditions of the vessel given that all mechanisms and controls are positioned above the airtight bridge **6** of the hull **1**.

Alternative Embodiment

It is obvious that in further alternative implementations falling within the concept solution subtended to the embodiments illustrated above and claimed below, the hull structure according to the present invention can be obtained using equivalent technical and mechanical elements, or supplemented with further integrating solutions, just like all the configurations of the relative components may vary to suit the purpose.

In particular:

the structuring and movement geometry of the elements for diverging the moveable bottom elements can alternatively be any suitable for the purpose with respect to the illustrated embodiments.

The actuators for moving the structures for diverging and retracting the moveable bottom elements can alternatively be of any kind and type suitable for the purpose with respect to the illustrated embodiments.

The temporarily supplementary cover extensions or bridges can be conceived and structured in any alternative manner suitable for the purpose with respect to the illustrated embodiments, even with reference to the respective retraction criteria.

The connection means and/or articulations between the structures for diverging and retracting the moveable bottom elements and the temporarily supplementary cover extensions or bridges can be conceived and structured in any alternative manner suitable for the purpose with respect to the illustrated embodiments.

Though preferably dedicated to recreational vessels, the solution concept can actually be applied to vessels, ships, boats and crafts intended for other purposes, for example for fishing or offshore operations.

An implemented solution concept can also be conceived where the bridge is used to also achieve the widening of an overlying cabin, for example with bellow walls or somehow "telescopic"; such application could for example be applied in river vessels, similarly to road means, caravans and motor home, with rooms applied laterally.

Safety devices of any type can be provided with the aim of preventing inadvertent actuation of the means for actuating the mechanisms.

Advantages of the Invention

As clear from the previous detailed description of the preferred embodiments and with the previous reference to some variant embodiments, the hull structure according to the present invention offers advantages corresponding to the attainment of the preset objects and other objects:

actually, it integrates a functional, modular, polyvalent and inexpensive solution concept adapted to allow at least the extension of the cover with the vessel stationary, facilitating the use thereof in activities that can be carried out on board in such conditions, without contraindications in terms of the sailing characteristics without implying greater overall dimensions in the conditions where a small overall dimension of the vessel is, on the contrary, preferable.

KEY TO THE REFERENCE NUMBERS

1) hull in its entirety
2) bottom element
2A) moveable bottom elements in the first embodiment
2B) longitudinal bottom sections or moveable bottom elements in the second embodiment
3) top side
3B) top side ejectable portions in the second embodiment
4) cover
4A) bellow panel or cover extensions in the first embodiment
4B) concealable panel cover extensions in the second embodiment
5) plankings or gunwales
5A) ejectable portions of the plankings in the first embodiment
5B) ejectable portions of the plankings in the second embodiment
6) airtight bridge
7) airtight chambers of the moveable bottom elements
8) interruptions between hull and ejectable portions of bottom element
9) compartments of the hull for housing the moveable bottom elements
10) curvilinear beams in the first embodiment
11) racks of the curvilinear beams in the first embodiment
12) symmetric pairs of parallel slots of the curvilinear beams in the first embodiment
13) guide rollers of the curvilinear beams in the first embodiment
14) pinions of the racks of the curvilinear beams in the first embodiment
15) shafts of the pinions of the racks of the curvilinear beams in the first embodiment
16) electric motors in the first embodiment
17) pins at the foot of the connecting rods in the first embodiment
18) connecting rods in the first embodiment
19) rectilinear beams in the first embodiment
20) guide rollers of the rectilinear beams in the first embodiment
21) stems of the hydraulic pinions in the second embodiment
22) hydraulic pinions in the second embodiment
23) telescopic casings in the second embodiment
24) pairs of external connecting rods in the second embodiment
25) pairs of internal connecting rods in the second embodiment
26) slots made on the sides del panel of cover extension in the second embodiment
27) compartment for housing the panel of cover extension in the second embodiment

The invention claimed is:

1. A hull structure comprising:

an insulated floating section (**2**A, **2**B; **3**A, **3**B) displaceable laterally by projecting actuators (**10**, **11**, **14**, **16**; **21**, **22**) from a first trim in recessed position within a matching cavity of a hull (**1**) to a second trim in projecting position outside said hull (**1**),

wherein said insulated floating section comprises movable longitudinal floating elements (**2**A, **2**B; **3**A, **3**B) housed in respective matching compartments (**9**) provided on two sides of the hull (**1**), and moveable planking or gunwale sections (**5**A, **5**B) positioned above said moveable longitudinal floating elements (**2**A, **2**B; **3**A, **3**B) and connected to retractable (**4**A) or concealable (**4**B) cover portions connected to a cover (**4**) of said hull (**1**),

wherein said projecting actuators (**10**, **11**, **14**, **16**; **21**, **22**) are positioned above an airtight bridge (**6**) of said hull (**1**), said projecting actuators (**10**, **11**, **14**, **16**; **21**, **22**) being constrained to said hull (**1**) and to said movable

longitudinal floating elements (2A, 2B; 3A, 3B) and configured to displace said movable longitudinal floating elements (2A, 2B; 3A, 3B) from a first trim position recessed in the hull (1) to a second trim position projecting outside of the hull, and vice versa,

wherein articulated pushing and drawing members comprise levers (18; 24, 25) and are apically connected to slots (12; 26) configured to move said retractable or concealable cover portions (4A; 4B) extracting and projecting said retractable or concealable cover portions (4A; 4B) laterally and to automatically displace said retractable or concealable cover portions (4A; 4B), and

wherein said articulated pushing and drawing members are connected to said projecting actuators (10, 11, 14, 16; 21, 22) and support a lateral displacement of said longitudinal floating elements (2A, 2B; 3A, 3B).

2. The hull structure according to claim 1,

wherein said movable planking sections (5A, 5B) comprise a folded bellow panel (4A), providing an extension connected to the cover (4),

wherein the projecting actuators comprises two or more curvilinear beams (10), each distally constrained to one of said movable longitudinal floating elements (2A), and are housed between the bridge (6) and the cover (4), said beams being provided in a respective lower portion with a rack (11) and in a respective upper portion with a slotted element (12) extending longitudinally and parallel to the curvilinear beams (10),

wherein the projecting actuators further comprise pinions (14) engaging said racks (11) of said curvilinear beams (10)*v* and an electric motor (16) operatively coupled to said pinions, and

wherein connecting rods (18) have pins (17) at first ends that engage said slotted elements (12) of said curvilinear beams (10) and are constrained apically at second ends to a head of said moveable planking or gunwale sections (5A), said head being fixedly coupled to rectilinear beams (19) sliding beneath the cover (4).

3. The hull structure according to claim 1,

wherein said movable longitudinal floating elements each comprise a lower portion (2B) and an upper portion (3B), said upper portion having the planking sections (5B) overhanging thereon, said floating elements being internally delimited by airtight chambers (6) insulated from the hull (1), said movable longitudinal floating elements being each configured to recede into a respective matching cavity defined adjacently to an airtight bridge provided on a side of the hull (1),

wherein stems (21) of additional linear actuators (22) are housed between the airtight bridge (6) and the cover (4) and are apically constrained to said movable longitudinal floating elements,

wherein telescopic casings (23) enclosing said stems (21) are distally integral with said movable longitudinal floating elements and are proximally sliding between the bridge (6) and the cover (4), said telescopic casings (23) being configured to be extracted and retracted automatically and simultaneously with a displacement of said lower portion (2B) and upper portion (3B), and

wherein said concealable cover portions (4B) are housed in compartments (27) beneath the cover (4),

further comprising a system (24, 25, 26) configured to move said concealable cover portions (4B) to a coplanar level with the cover (4) when extracted, said system comprising pairs of connecting rods (24, 25) hinged to the cover (4) and sliding on said concealable cover portions (4B).

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